



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): TRUNG VAN NGUYEN )

Attorney Docket No. NGTV.70965

Serial No. 09/552,419 )

Group Art Unit 1745

Filed: April 19, 2000 )

Examiner: D. D. Yuan

METHODOLOGY AND APPARATUS )  
FOR SUPPLY OF REACTANT FLUIDS )  
TO AND PURGING OF PRODUCT AND )  
INERT FLUIDS FROM CELLS OF FUEL )  
CELL STACK )

#10  
Hepta  
2/19/02

CERTIFICATE OF MAILING  
37 C.F.R. 1.8

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20231, on:

1/18/02

Date

*Joanne Smith*  
Signature

**DECLARATION OF PRIOR INVENTION IN THE  
UNITED STATES TO OVERCOME CITED PATENT**

Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

This declaration is to establish completion of the invention of this application in the  
United States, at a date prior to October 6, 1999, that is the effective date of the Herron patent (US  
6,242,120 B1) cited by the examiner.

The person making this declaration is the inventor.

**FACTS AND DOCUMENTARY EVIDENCE**

To establish the date of completion of the invention of this application, the following  
attached documents are submitted as evidence:

- ☒ Photocopies of Lab Notebook Page 013 and 062.
- ☒ Photocopies of Sketches and Specifications (5 pages)

The dates have been redacted from the foregoing documents; however, these documents were all generated prior to October 6, 1999. The conception of the invention is shown by notebook page 013, the sketches illustrate the equipment used to reduce the invention to practice, and data collected during the reduction to practice are shown on notebook page 062. Accordingly, it is clear that the invention of the application was conceived and reduced to practice at least by the October 6, 1999 effective date of the Herron patent.

#### **TIME OF PRESENTATION OF THE DECLARATION**

This declaration is submitted in response to the first office action and there has been no final rejection in this application.

#### **DECLARATION**

As the person signing below, I hereby declare that all statements made herein of my own knowledge are true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful statements may jeopardize the validity of the application or any patent issued thereon.

#### **SIGNATURE**

Full name of sole inventor: TRUNG VAN NGUYEN

Inventor's signature  Date 1/15/2002

Country of Citizenship: United States of America

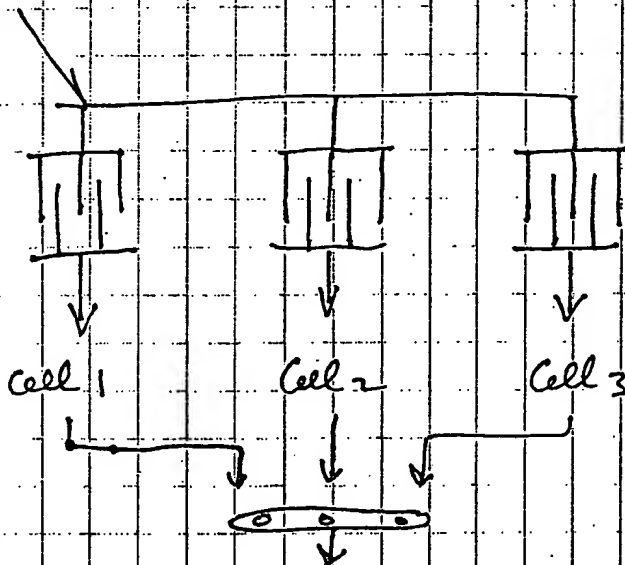
Residence: Lawrence, Douglas County, Kansas

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Trang Nguyen

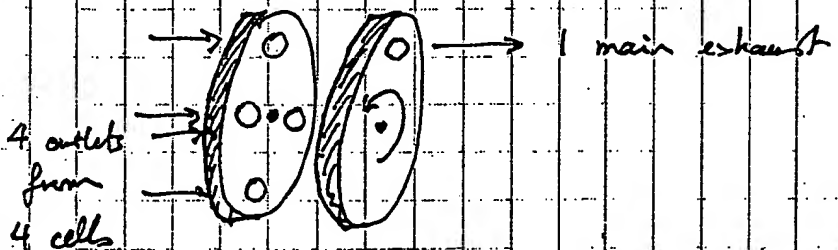
013

# Gas Flow Scheme for fuel cells using interdigitated flow fields.



Even Gas distribution to each cell in a stack is currently the most difficult problem, especially when interdigitated flow fields are used. Even though record-performance is obtained with cells using interdigitated flow fields, however, when cells with these flow fields are assembled into a stack, uneven flow to each cell is obtained. This is due to the larger  $\Delta P$  and variations in  $\Delta P$  of each cell. To solve this problem, the following scheme is proposed: Only one outlet of each cell is allowed at a given time, so that that cell can be flushed of entrapped well

water. Each cell will be given its turn as the exhaust device is rotated. The speed can be controlled to allow optimal distribution



Flow through each cell is controlled by this device and no longer by the  $\Delta P$  of each cell.

Witness: Som Chakrabarti

Name: Alan Jim Mack

Experiment: Baseline  $\rightarrow$  Back 23  $\leftarrow$  Front

3 cell stack 062

$T = 50^\circ\text{C}$

Anode gas = 15  
Cathode gas = 20

Anode  $\text{H}_2\text{O} = 0.025 \text{ in}$

Current

Gas inlet  
back

Front

I	$V_{\text{Total}}$	$V_1$	$V_2$	$V_3$	$T_1$	Gradient
0.0	2.661	.885	.876	.894	$\approx 55^\circ\text{C}$	5
4.0	1.868	.635	.615	.616	55	5
5.0	1.757	.598	.579	.580	55	2
6.0	1.719	.580	.575	.567	63	5
7.0	1.620	.523	.542	.554	60	2
8.0	1.51	.45	.520	.545	61	2
9.0	*	$V_1$ in Rev 03a1				

$\text{H}_2\text{O} = 0.010 \text{ in}$

~~HA~~

Mack



Implement the sequential pulsing concept!

Two new cells, 4 and 5 with 1.

Running with Air as Cathode gas. Cannot use overload. When running w/in fans, steady around 1.450 V. If I manually close the exhaust from the last two cells and the open them up 1 second intervals the cell improves to about 1.650 V

Front  $\oplus$  - 4

Cell 3 - 3

Cell 2 - 2

Cell 1

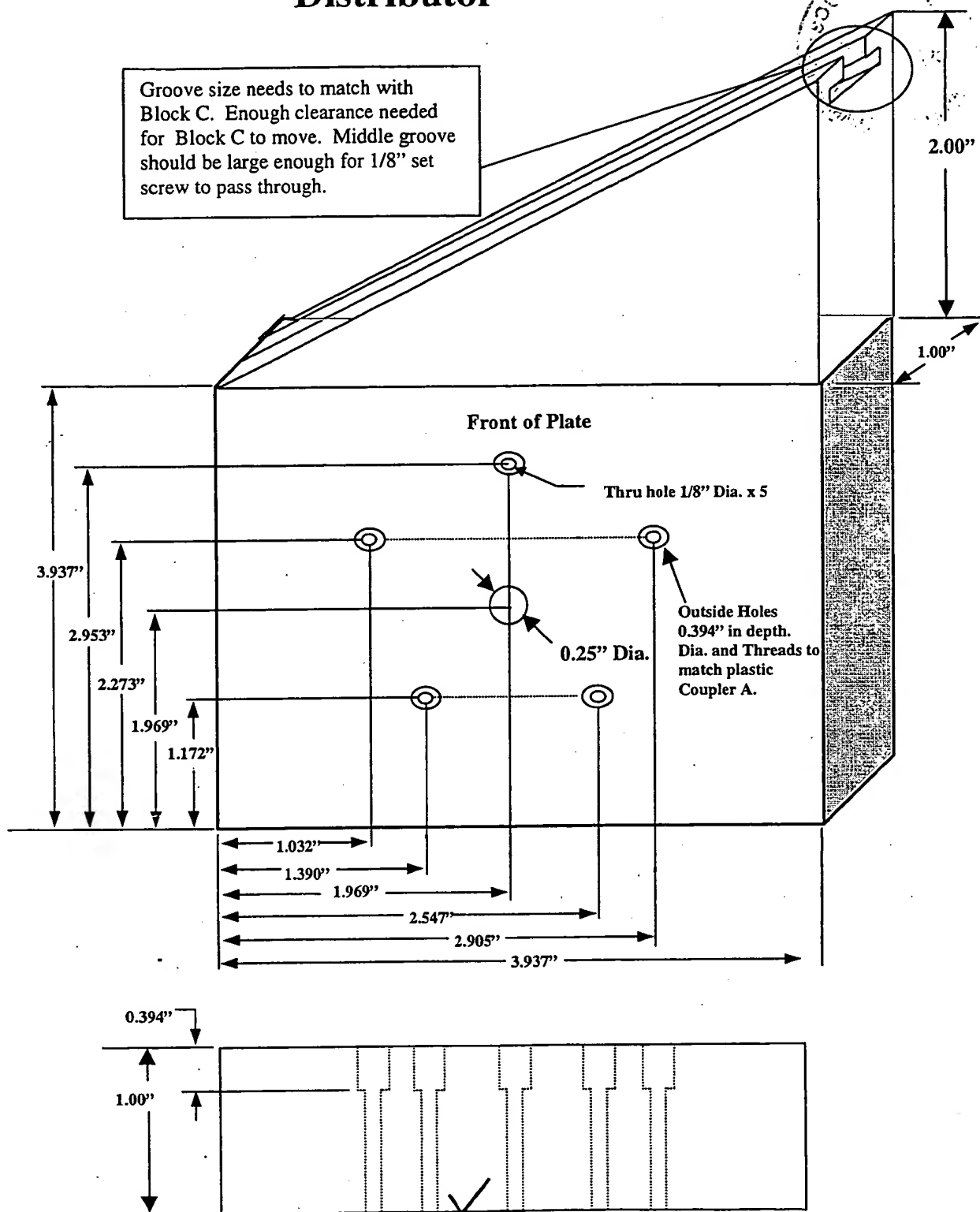
Back  $\ominus$  - 1

(-) (+)  
Barc + RV = Cell Volt

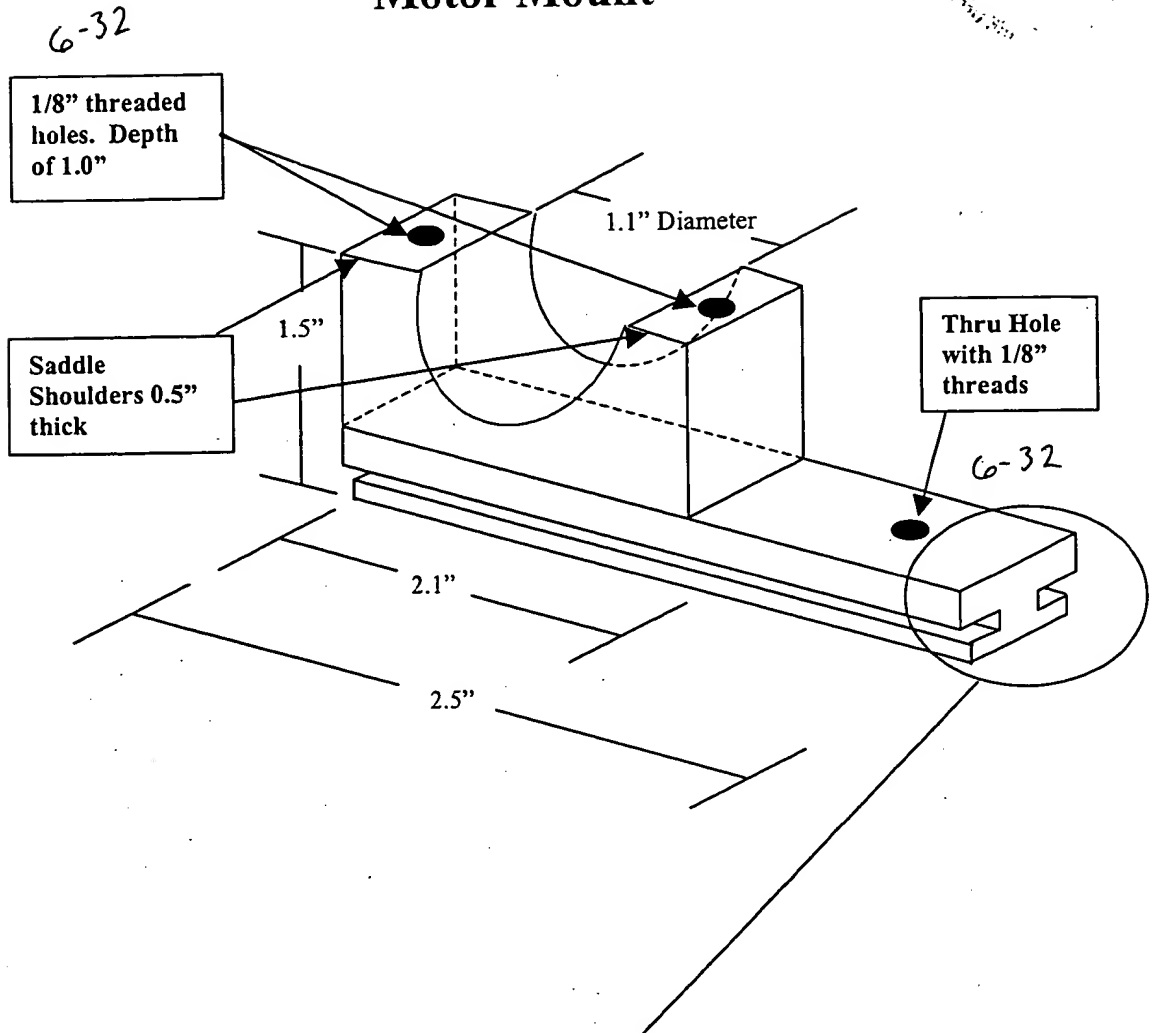
(+) (-)  
3 + Rest Yellow = Cell 2  
2 + RV = Cell 1

# Distributor

Groove size needs to match with Block C. Enough clearance needed for Block C to move. Middle groove should be large enough for 1/8" set screw to pass through.



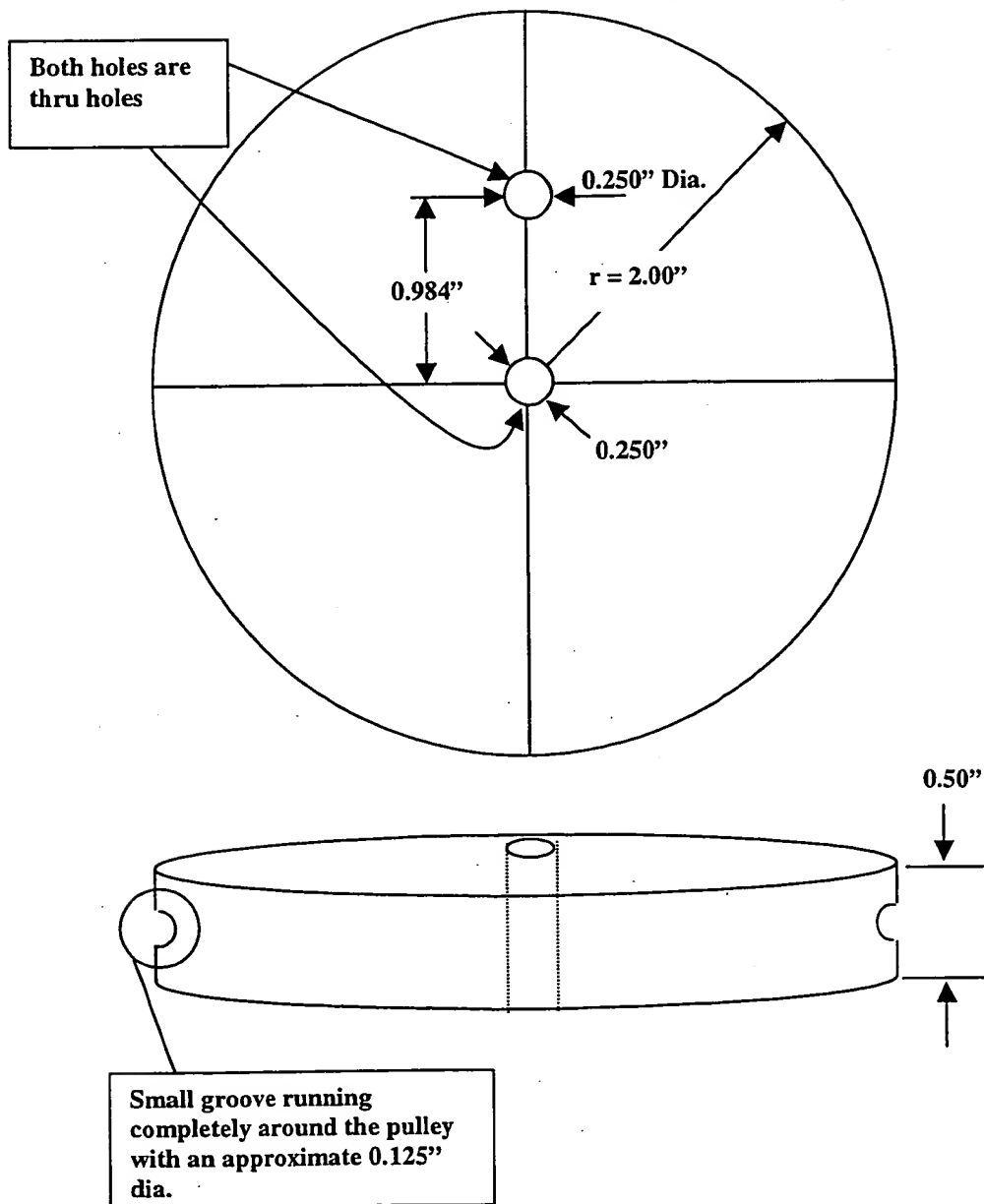
## Motor Mount



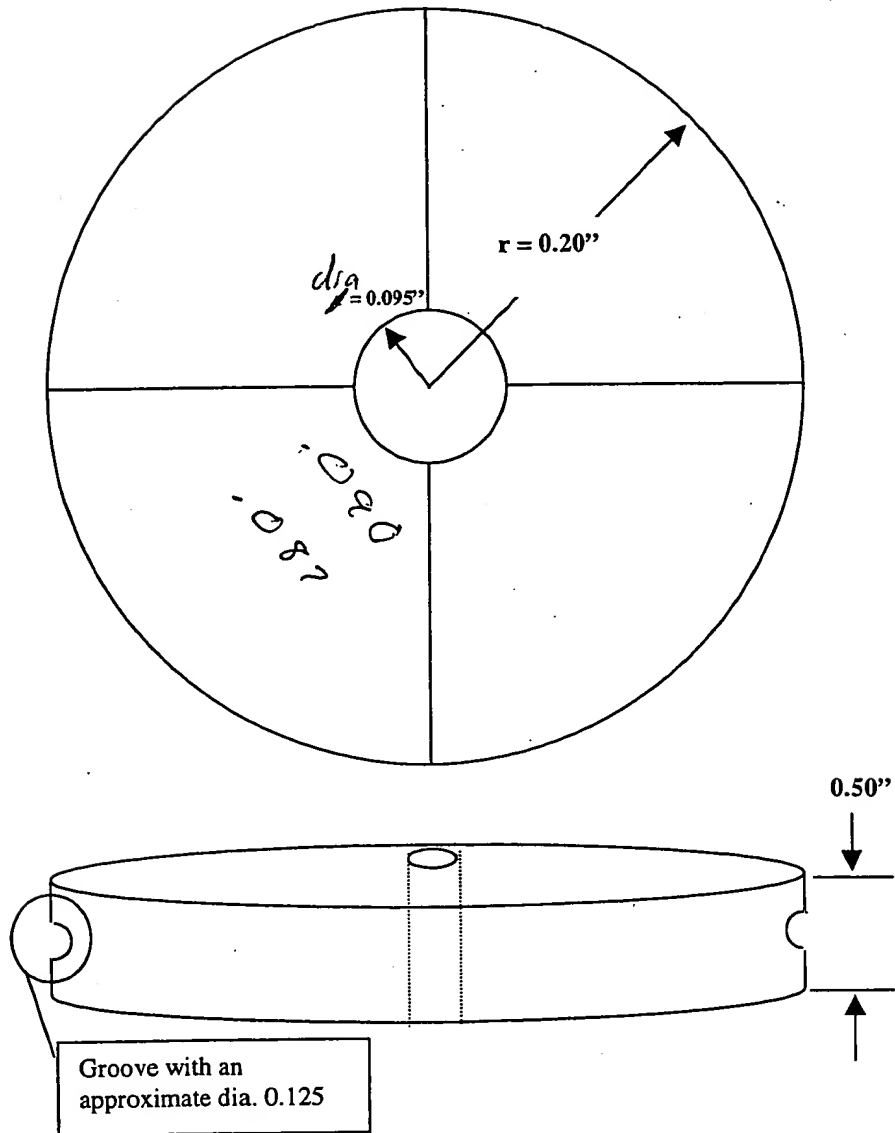
### Specifications for Motor Mount:

- Material is Ultra High Molecular Weight (UHMW) Polyethylene.
- The "T" should be machined such that it fits inside the groove on the Distributor.
- The width of the motor mount is 1.00" except for bottom of "T". It is approximately 0.5".

# Pulley A



# Pulley B





### **Specifications for Plates 1, 2, and 3**

- Plates need to be modified from existing plates
- Modification is only of the yellow highlighted sections on diagrams.
- Modifications include only adding holes and grooves to existing plates

### **Specifications for Plate A and Plate B**

- Material - Plexiglass. The sheet found in the basement shop
- Front and Back Surfaces should be flat and smoothed.
- Threads match Plastic Coupler A
- Hex Head inset size is 7/16, i.e. bolt fits a 7/16 wrench

### **Specifications for Distributor, Motor Mount and Pulleys**

- Material – UHMW Polyethylene. 12"x12"x1" sheet. On order from MSC.
- Surfaces should be flat and smoothed.
- Threaded holes in distributor should match Plastic Coupler A.
- Threaded holes in Motor Mount should have threads for standard 1/8" bolt. 6-32